

WHAT IS CLAIMED IS:

1. A dental handpiece comprising:
  - a housing;
  - a drill head protruding from said housing, said drill head operably connected to a motor mounted in said housing; and
  - a light source mounted in said housing, said light source operable to produce a light through an opening in said housing, said opening being located in said housing such that said light produced by said light source is projected substantially in a direction along which said drill head protrudes from said housing, said light having a desired wavelength operable to produce tooth luminescence.
2. The dental handpiece of Claim 1, further comprising:
  - a fiber optic bundle connecting said light source to said opening.
3. The dental handpiece of Claim 1, further comprising:
  - a glass rod assembly connecting said light source to said opening.
4. The dental handpiece of Claim 1, wherein said light produced by said light source has a wavelength in the blue-violet region of the visible spectrum.
5. The dental handpiece of Claim 1, wherein said light produced by said light source has a wavelength of 405 nm.
6. The dental handpiece of Claim 1, wherein said light source comprises a filament lamp having a filterglass bulb.
7. The dental handpiece of Claim 1, wherein said light source comprises a semiconductor device.

8. A dental handpiece comprising:

a housing;

excavation means for excavating a portion of carious material occupying a portion of a tooth;

illumination means for emitting a light of a desired wavelength operable to produce tooth luminescence, said illumination means mounted in said housing; and

guide means for guiding an emitted light from said illumination means to an opening in said housing, said opening being located in said housing such that said emitted light is projected onto said tooth when said excavation means is operably positioned for excavating said portion of carious material.

9. The dental handpiece of Claim 8, wherein said excavation means comprises a drill head protruding from said housing and operably connected to a motor mounted in said housing.

10. The dental handpiece of Claim 8, wherein said illumination means comprises a filament lamp with a filterglass bulb having a cutoff wavelength whereby said emitted light is in the blue-violet region of the spectrum.

11. The dental handpiece of Claim 8, wherein said illumination means comprises a semiconductor device.

12. The dental handpiece of Claim 11 where said emitted light has a wavelength of 405 nm.

13. An apparatus for facilitating removal of a carious region occupying a portion of an enamel layer and a dentin layer of a tooth, comprising:

a dental handpiece, comprising:

    a housing;

    a drill head protruding

    from said housing, said drill head

    operably connected to a motor mounted in

    said housing; and

        a light source mounted in

        said housing, said light source operable to

        produce a light through an opening in said

        housing, said opening being located in

        said housing such that said light produced

        by said light source is projected

        substantially in a direction along which

        said drill head protrudes from said

        housing, said light having a desired

        wavelength operable to produce tooth

        luminescence;

        filter means for filtering a luminescence of said tooth

    caused by said light produced by said light source, said filter means

    having a cutoff wavelength whereby said light produced by said light

    source cannot traverse said filter means.

14. The apparatus of Claim 13, wherein said cutoff wavelength of said filter comprises a wavelength in the green portion of the visible spectrum, whereby only light having a wavelength in or above the green portion of the visible spectrum traverses said filter means.

15. A method of identifying a caries in a tooth, comprising:  
projecting a light of a desired wavelength onto the tooth, said light causing a luminescence of the tooth;  
observing the luminescence of the tooth;  
identifying a red-orange central region surrounded by an intensely luminescent region and a dark outer ring, whereby the intensely luminescent region is intermediate the red-orange central region and the dark outer ring; and  
recognizing the red-orange central region as a bacterially invaded region.

16. The method of Claim 15, wherein said intensely luminescent region intermediate the red-orange central region and the dark outer ring comprises a green region.

17. The method of Claim 15, wherein said step of observing the luminescent emission comprises placing a filter intermediate the tooth and an eye of an observer, and observing the luminescent emission through the filter.

18. The method of Claim 15, further comprising:

identifying the dentin layer of the tooth, the dentin layer comprising a luminescent region outside the dark outer ring, the dentin layer being less intensely luminescent than the intensely luminescent region, whereby the dentin layer appears yellow-green.

19. The method of Claim 18, further comprising:

identifying the enamel layer of the tooth, the enamel layer comprising an area beyond the luminescent region comprising the dentin layer of the tooth, the enamel layer being less luminescent than the dentin layer.

20. The method of Claim 17, wherein said filter comprises a high-pass filter having a cutoff wavelength in the green region of the visible spectrum.

21. The method of Claim 15, wherein said desired wavelength comprises 405 nm.

22. A method of excavating carious material in a tooth, comprising:  
providing a dental handpiece having a housing, and a drill head protruding from the housing, the drill head being operably connected to a motor mounted in the housing, the dental handpiece further including a light source mounted in the housing and being operable to produce a light through an opening in the housing, the opening being located in the housing such that the light produced by the light source is projected substantially in a direction along which the drill head protrudes from the housing, said light having a desired wavelength operable to produce tooth luminescence;

activating the light source to produce said light;

positioning the dental handpiece to project said light onto the tooth, said light causing a luminescence of the tooth;

observing the luminescence of the tooth and thereby identifying the carious material;

actuating the drill head; and

applying the drill head to the carious material.

23. The method of Claim 22, wherein said desired wavelength comprises 405 nm.

24. The method of Claim 22, wherein said step of observing the luminescence of the tooth and thereby identifying the carious material comprises the steps of:

identifying a red-orange central region surrounded by an intensely luminescent yellow-green region and a dark outer ring, whereby the intensely luminescent region is intermediate the red-orange central region and the dark outer ring; and

recognizing the red-orange central region as a bacterially invaded zone.

25. The method of Claim 24, wherein said step of observing the luminescence of the tooth and thereby identifying the carious material further comprises the steps of:

placing a filter intermediate the tooth and an eye of an observer; and  
observing the luminescence of the tooth through the filter.

26. The method of Claim 24, further comprising:

identifying a dentin layer of the tooth, the dentin layer comprising a luminescent region outside the dark outer ring, the dentin layer being less intensely luminescent than the intensely luminescent region, whereby the dentin layer appears yellow-green.

27. The method of Claim 26, further comprising:

identifying an enamel layer of the tooth, the enamel layer comprising an area beyond the luminescent region comprising the dentin layer of the tooth, the enamel layer being less luminescent than the dentin layer.

28. A method of excavating carious material in a tooth, comprising:

providing a dental handpiece having: a housing; excavation means for excavating a portion of carious material occupying a portion of the tooth, said excavation means integral with said dental handpiece; illumination means for emitting a light of a desired wavelength operable to produce tooth luminescence, said illumination means mounted in said housing; and guide means for guiding an emitted light from said illumination means to an opening in said housing, said opening being located in said housing such that said emitted light is projected onto said tooth when said excavation means is operably positioned for excavating said portion of carious material;

activating the illumination means to produce said light;

positioning the dental handpiece to project said light onto the tooth, said light causing a luminescence of the tooth;

observing the luminescence of the tooth and thereby identifying the carious material;

actuating the excavation means; and

applying the excavation means to the carious material.

29. The method of Claim 28, wherein said step of observing the luminescence of the tooth and thereby identifying the carious material comprises the steps of:

identifying a red-orange central region surrounded by an intensely luminescent yellow-green region and a dark outer ring, whereby the intensely luminescent region is intermediate the red-orange central region and the dark outer ring; and

recognizing the red-orange central region as a bacterially invaded zone.

30. The method of Claim 29, wherein said step of observing the luminescence of the tooth and thereby identifying the carious material further comprises the steps of:

placing a filter intermediate the tooth and an eye of an observer; and  
observing the luminescence of the tooth through the filter.